Remarks to solve disagreement between Gravity anisotropy and constraints on the variation of Gravitational constant (big G) based on gravimetric data

Mikhail L. Gershteyn (1), Lev I. Gershteyn (1), Arkady Gershteyn (1, 3), Oleg V. Karagioz (2)
(1) Insight Product Co., Newton, MA, U.S.
(2) Tribotech division of National Institute of Aviation Technology, Moscow, Russia
(3) Umass, Amherst, MA, USA

At the end of September 2002 C.S. Unnikrishnan and G.T. Gillies published an article on arxiv.org entitled "Nano-constraints on the spatial anisotropy of the Gravitational Constant" (gr-qc/0209093) In this interesting work the two authors constrain the spatial variation of Delta G/G to be no greater than 10^{-10} based on experimental data on variation of weight (gravimetric data) and on Lunar Laser Ranging (LLR) experiments. At first view this constraint drastically disagrees with variation claimed in our work (Mikhail L. Gershteyn, Lev I. Gershteyn, Arkady Gershteyn, Oleg V. Karagioz “Experimental evidence that the gravitational constant varies with orientation.” On arxiv.org under physics/0202058, and published in Gravitational & Cosmology Vol.8 (2002), No.3 (31), pp.243-246)

Yet this disagreement exists only in assumptions that gravitational anisotropy does not depend on the magnitude of the interacting masses and the distance between them. In absence of such assumption, the controversy disappears because the masses and distances in the experiments analyzed by C.S. Unnikrishnan and G.T. Gillies dramatically differ from those in our experiment as well as in other experiments connected with G measurements. The hypothesis of distance dependence of G anisotropy was proposed several months ago by Robert D. Reasenberg in discussion concerning our findings at Harvard-Smithsonian Center for Astrophysics.

Also it is necessary to clarify the questions concerning period of G anisotropy mentioned by C.S. Unnikrishnan and G.T. Gillies. The experiment was carried out in Moscow. The orientation of the line connecting the test mass m with the source mass M was 36 degrees east of south (144 degree azimuth). It is easy to see that this line has the same direction relative to the stars only once per one rotation of the earth. Therefore the observed signal has the expected frequency of once per day. We are grateful to C.S. Unnikrishnan and G.T. Gillies for their attention to our work and welcome further discussion.